

# **Layered Coefficient Routing (LAY-COEF) Model**

## **1. Description of Algorithm**

Layered coefficient routing is a routing method that attenuates discharge in a reach by applying different routing coefficients to different levels of flow.

<https://vlab.ncep.noaa.gov/documents/207461/1893022/24laycoef.pdf>

## **2. Model Parameters**

LAY-COEF uses an XML representation of model parameters where each parameter is captured within a separate XML tag. The tags are closely related to the NWSRFS definition of LAY-COEF defined at:

<https://vlab.ncep.noaa.gov/documents/207461/1893022/533laycoef.pdf>

Name	Type	Required [Yes/No]	Comment
GENERAL_INFO	String	Yes	General information for this operation.
TS_INFLOW_ID	String	Yes	Internal identifier for the inflow time series.
TS_INFLOW_TYPE	Integer	Yes	Data type code for the inflow time series.
TS_INFLOW_TIMESTEP	Integer	Yes	Time interval for the inflow time series.
TS_OUTFLOW_ID	String	Yes	Internal identifier for outflow time series (blank if routing at a point).
TS_OUTFLOW_TYPE	String	Yes	Data type code for outflow time series (blank if routing at a point).
TS_OUTFLOW_TIMESTEP	Integer	Yes	Time interval for outflow time series (blank if routing at a point).
NUMBER_OF_LAYERS	Double	Yes	Number of layers.
LAYER_COEFFICIENTS	Table	Yes	Coefficients for layered coefficient routing beginning with the bottom layer. If there are more than seven layers the succeeding data cards are read until all coefficients are input.

LAYER_UPPER_LIMIT_FLOW	Table		Upper limit of flow for each layer beginning with the bottom layer. There is no upper limit for the top layer. If there is only one layer this card is not needed.
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Sample Parameters xml file:

```

<parameter id="NUMBER_OF_LAYERS">
    <intValue>6</intValue>
</parameter>
<parameter id="GENERAL_INFO">
    <stringValue>GREENUP</stringValue>
</parameter>
<parameter id="TS_INFLOW_TYPE">
    <stringValue>SQIN</stringValue>
</parameter>
<parameter id="TS_OUTFLOW_TIMESTEP">
    <intValue>6</intValue>
</parameter>
<parameter id="TS_INFLOW_ID">
    <stringValue>GNUK2LG</stringValue>
</parameter>
<parameter id="TS_OUTFLOW_ID">
    <stringValue>GNUK2RT</stringValue>
</parameter>
<parameter id="LAYER_COEFFICIENTS">
    <table>
        <columnTypes A="double"/>
        <row A="0.35"/>
        <row A="0.45"/>
        <row A="0.55"/>
        <row A="0.6"/>
        <row A="0.9"/>
        <row A="1.0"/>
    </table>
</parameter>
<parameter id="LAYER_UPPER_LIMIT_FLOW">
    <table>
        <columnTypes A="double"/>
        <row A="22090.1"/>
        <row A="17841.9"/>

```

```

<row A="10761.8"/>
<row A="7929.8"/>
<row A="4956.1"/>
</table>
</parameter>
<parameter id="TS_INFLOW_TIMESTEP">
  <intValue>6</intValue>
</parameter>
<parameter id="TS_OUTFLOW_TYPE">
  <stringValue>SQIN</stringValue>
</parameter>

```

### 3. Model States

LAY-COEF model states are defined in a property file format. An example is shown below. The model state property names are:

Property Name	Description
FLOW_LAYER#0 <sup>1</sup>	Initial carryover for each layer beginning with the bottom layer
UNIT	Units for State Variables (always METRIC)

An example is shown below.

```

FLOW_LAYER#0=0.00
FLOW_LAYER#1=0.00
UNIT=METRIC

```

### 4. Model Time Series

LAY-COEF requires 1 input time series and 0 or 1 output time series

Time Series Type	Internal Model Units	Time Step	Input or Output	Missing Values Allowed	Required [Yes or No]
Channel inflow	CMS	any	Input	No	Yes
Channel outflow	CMS	<u>2</u>	Output	Yes	Yes <u>1</u>

1/ Output time series not required if routing is performed at a point.

2/ Must be greater than or equal to data time interval of the inflow

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<sup>1</sup> Flow values for each layer are represented using the keyword “FLOW\_LAYER” and an index. The indices start from 0, and increment by 1 for each layer (where the number after the '#' represents the layer number)

## **5. Notes about configuring Model in FEWS workflow**

Examples:

Module Configuration File

[ModuleConfigFiles\LAYCOEF\\_FLNI4\\_FLNI4LOC\\_Forecast.xml](#)

Module Parameter File

[ModuleParFiles\LAYCOEF\\_FLNI4\\_FLNI4LOC\\_UpdateStates.xml](#)

## **6. FEWS Adapter Used**

The LAY-COEF model uses the OHDFewssadapter to communicate. Information about this adapter can be found at [OHDFewssadapter](#).